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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/500,181

02/07/2000

Alexander Berestov

3716(CFP1047US)

2223

7590

02/24/2004

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EXAMINER

PATEL, SHEFALI D

ART UNIT

PAPER NUMBER

2621

DATE MAILED: 02/24/2004

17

Please find below and/or attached an Office communication concerning this application or proceeding.

2

Office Action Summary

Application No.

09/500,181

Applicant(s)

BERESTOV, ALEXANDER

Examiner

Shefali D Patel

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 13-19 is/are rejected.
- 7) ☒ Claim(s) 10-12 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 06, 2004 has been entered.

Response to Amendment

2. The amendment after final rejection filed on November 10, 2003 has been entered.

Response to Arguments

3. Applicant's arguments filed on November 10, 2003 have been fully considered but they are not persuasive. Applicant first argue starting on page 10 of remarks that "the office action took the position that "choice of direction is common," which implies a symmetry between the first and second correspondence searches that is not reflected in the claims." When the examiner stated "*The choice of direction is common and therefore, it would have been obvious to a person of ordinary skill in the art to not search any points to the left of the first point in the right image to find the edge of the overlapped region of two stereo images,*" the examiner did not assume or implied that there exist any symmetry between the first and second correspondence searches. It simply means that choosing to search left to the point or right to the point is merely a design choice and hence, the choice of direction would be common. Note: Gerstenberger discloses a method for running a second correspondence search on the first matching point (point 25 in image 21, Fig. 4) to find a second matching point in the right image.

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Gerstenberger's invention searches the second corresponding search to the left of first matching point. Also, *knowing the left boundary of the right image in the overlap region (after searching for the first matching point), one is motivated to search to the right of the first point to find the boundary (i.e., edge) of the left image.* This way, overlapped region is obtained.

Applicant argues at the bottom of page 10 that "this assertion is made without any citation to the prior art." Please note that determining an overlap is conventional in the art and also as seen in the Gerstenberger's invention for determining the parallax between the two images of the scene.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-5 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gerstenberger (USPN 5,220,441).

With regard to **claim 1**, Gerstenberger discloses a method for locating matching points in two images of a scene, a left image (image 22, Fig. 4) and a right image (image 21, Fig. 4) such that the images have at least some overlap area (note that Gerstenberger determines parallax between two images, hence these two images do overlap). Gerstenberger discloses a method that selects a first point within the overlap area in the right image (point 25 in image 21, Fig. 4). Also, running a first correspondence search using the first point to find a first matching point in the left image (point 26 in image 22, Fig. 4). Further, Gerstenberger discloses a method running

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a second correspondence search on the first matching point (point 25 in image 21, Fig. 4) to find a second matching point in the right image, *(wherein the range of the second correspondence search is narrower than a range of the first correspondence search)*. Gerstenberger's invention searches the second corresponding search to the left of first matching point. Applicant is claiming for the second corresponding search to the right of the first matching point. The choice of direction is common and hence it would have been obvious to a person of ordinary skill in the art to not search any points to the left of the first point in the right image to find the edge of the overlapped region of two stereo images. Knowing the left boundary of the right image in the overlap region, one is motivated to search to the right of the first point to find the boundary (edge) of the left image. This way, overlapped region is obtained. *It is obvious that the second corresponding search is narrower than the range of the first corresponding search. Since, the second correspondence search is not being ran on any points to the left of the first point (i.e., second correspondence search is either ran on any points right of the first point or along any points of the first point), it automatically narrows the range of the second correspondence search than the range of the first correspondence search.*

Gerstenberger discloses a method selecting a match point comprising the first matching point and second matching point at column 10 lines 43-50. Note that the match point is selected after evaluating the search window (SW) and corresponding window (CW).

Claim 18 recites identical features as claim 1 except claim 18 is a system claim. Thus, arguments similar to that presented above for claim 1 is equally applicable to claim 18.

Additionally, **Claim 18** includes an additional element of storage device in its system, which is

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disclosed in Gerstenberger's invention at column 6 lines 11-15 and also shown at element 100 in Figure 2.

With regard to **claim 2** Gerstenberger discloses a method where the step of selecting a match point comprising selecting only those match points in which the second matching point is same as the first matching point at column 7 lines 52-60.

With regard to **claim 3**, Gerstenberger discloses a method where the step of running the first correspondence search comprises running a classic stereo correspondence search at column 6 lines 11-17.

With regard to **claim 4**, Gerstenberger discloses a method where the second correspondence search uses a different matching algorithm than the algorithm used in the first correspondence search at column 9 lines 44-53. Second correspondence search is run by identifying location of the tie points, where the first correspondence search is determined using the boundary windows.

With regard to **claim 5**, Gerstenberger discloses a method where the step of running the first correspondence search comprises running a correlation-based matching algorithm at column 8 lines 35-41. Note that the correlation-based matching algorithm is used throughout the Gerstenberger's invention.

3. Claims 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gerstenberger, as applied to claim 1 above, in view of Onda (USPN 5,867,591).

With regard to **claims 6** Gerstenberger does not expressly disclose the step of running a first correspondence search comprising a feature-based matching algorithm. Onda discloses a

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method where the step of running the first correspondence search comprises running a feature-based matching algorithm (See, column 12 lines 25-30). One of ordinary skill in the art would have been motivated to use the feature-based matching algorithm of Onda in order to evaluate the corresponding points of the edges that come in contact when two images are overlapped.

With regard to **claim 7**, Onda discloses a method where the step of running the first correspondence search comprises running a phase-based matching algorithm (See, column 10 lines 13-28), respectively.

4. Claims 8, 13-17 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gerstenberger in view of Onda as applied to claims 1-7 above, and further in view of Chen et al. (USPN 5,917,962).

With regard to **claim 8**, Gerstenberger (as modified by Onda) discloses all of the claimed subject matter as already discussed above in paragraphs 2-3 and the arguments are not repeated herein, but are incorporated by reference. Claim 8 distinguishes from claim 1 only in that it recites splitting the left and the right image into left and right subimages wherein each subimage comprises the values of only one of the color coordinates used to define the image with which it is associated; pairing each left and right subimages, which uses the same color coordinate values. However, Chen et al. discloses method of partitioning an image where the subimages comprises the values of only one of the color coordinates used to define the image with which its associated (Figure 4 and it's respective section in specification). Chen et al. teaches the concept of subimages evaluating on a pixel-by-pixel (column 1 lines 13-25) and it is also well known in the art. At the time the invention was made, it would have been obvious to a person of ordinary skill

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in the art to split the image into subimages and evaluate each subimages depending on the color coordinate value and to pair each subimages that uses the same color coordinate values. By doing this, one can decrease the memory requirement associated with color data to provide more efficient transmission and storage of the image.

Note: Gerstenberger discloses storing each selected match point in a list of match points (column 15 lines 19-20). And, Onda discloses a method in matching stereo images where the two images, left and right, are split in left and right subimages (column 11 lines 9-14).

With regard to **claims 13-15**, the recited features are the same as those in claims 3-5, and the arguments in paragraph 8 above as to the relevance of Gerstenberger are incorporated herein.

With regard to **claims 16-17**, the recited features are the same as those in claims 6-7, and the arguments in paragraph 9 above as to the relevance of Gerstenberger and Onda are incorporated herein.

With regard to **claim 19**, both Gerstenberger and Chen et al. discloses a computer-readable medium in Figure 2 and Figure 1, respectively. The recited features are the same as those in claim 8, and the arguments in paragraph 10 above as to the relevance of Gerstenberger, Onda, and Chen et al. are incorporated herein.

5. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gerstenberger in view of Onda in view of Chen et al. as applied to claim 8 above, and further in view of Prazdny (USPN 4,745,562).

Regarding **claim 9**, Prazdny discloses a method of comparing the matching points stored in the list of match points that correspond to the given point across each subimage pair (column 8

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lines 36-41) and responsive to the matching points in the list of matching points being different for each subimage pair (column 9 lines 3-17), removing the matching point from the list of match points (column 10 lines 28-39, note that finding the best “allowable matches within a window” the matching point is determined).

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to combine the invention of Prazdny (finding, comparing and removing the matching points from the list (or table)) with the inventions of Gerstenberger, Onda and Chen et al. One can expedite the process by using the list of stored matching points to compare each pixel of subimages.

Allowable Subject Matter

6. Claims 10 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The closest prior art to Gerstenberger directed to a method for determining parallax between first and second images of a scene employing an iterative image pattern search and correlation process by running a correspondence search on points. However, Gerstenberger says nothing about retrieving a distance value which represents the distance between the camera location used to capture the right image and the camera location used to capture the left image; and creating a disparity map of the scene captured by the images by determining a disparity value for each point in the image, wherein values in the disparity map are calculated by sing the distance between the match points that correspond to the point in the disparity distance map in the list of match points in conjunction with the retrieved value. It is for this reason in combination with all the other elements of the claim that claim 10 would be

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allowable if rewritten in independent form including all of the limitation of the base claim and any intervening claims.

Claims 11-12 depends from claim 10 and therefore claims 11-12 would be allowable for the same reasons.


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shefali D Patel whose telephone number is 703-306-4182. The examiner can normally be reached on M-F 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo H Boudreau can be reached on 703-305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DANIEL MARIAM
PRIMARY EXAMINER


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PRIMARY EXAMINER

Shefali D Patel
Examiner
Art Unit 2621

February 12, 2004